TCP/IP Model

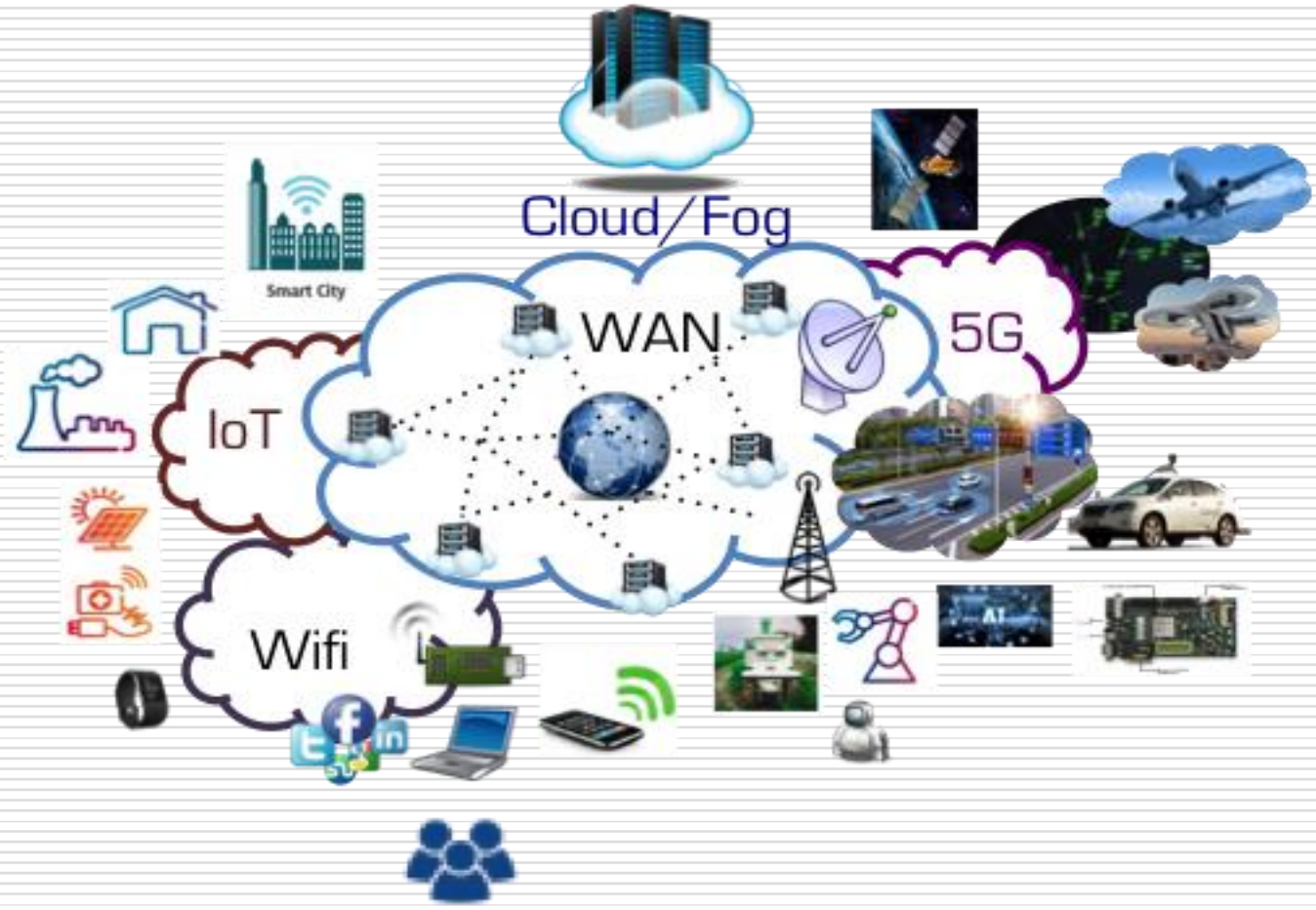
Introduction

The TCP/IP model (Transmission Control Protocol/Internet Protocol), also called the DOD model (Department of Defense), was developed by an agency of the U.S. Department of Defense, DARPA (Defense Advanced Research Projects Agency), around the 1970s.

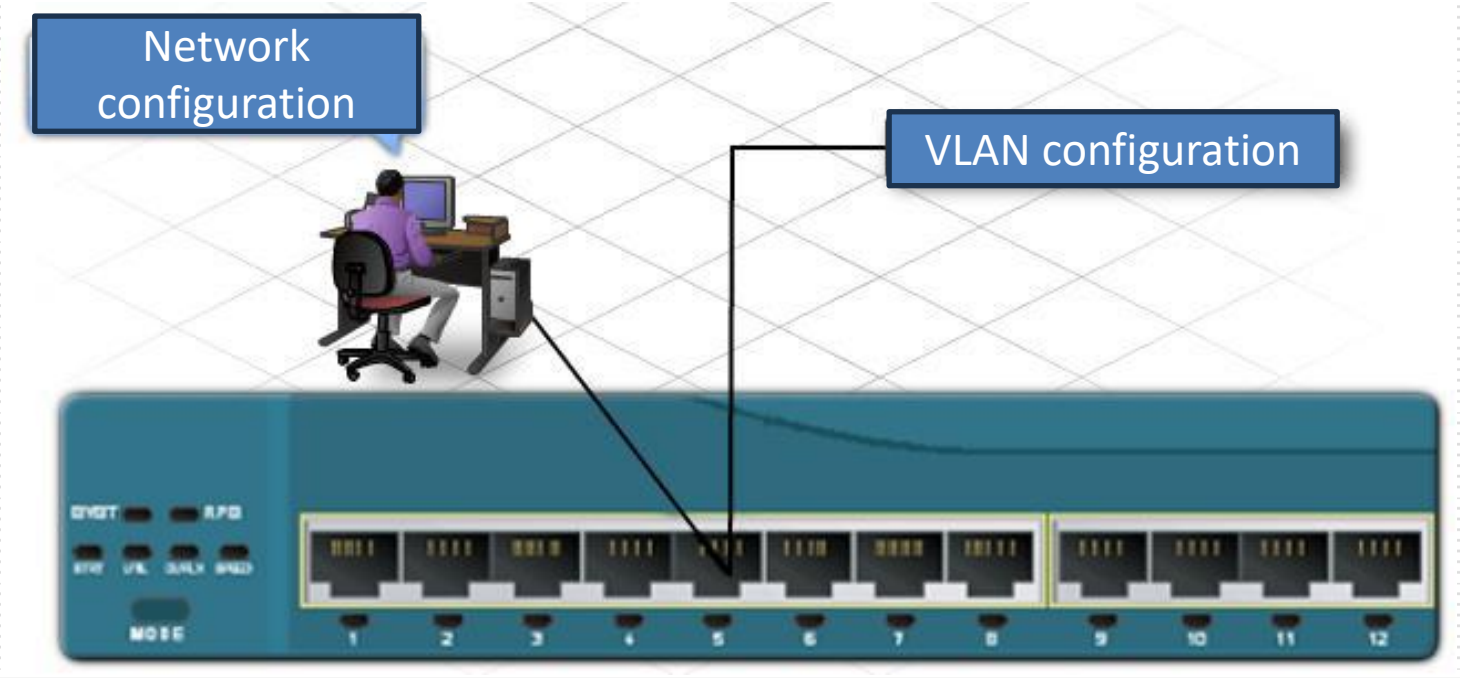
General Overview of the TCP/IP Model

The TCP/IP model is the basic framework for internet network communication.

General Overview of the TCP/IP Model



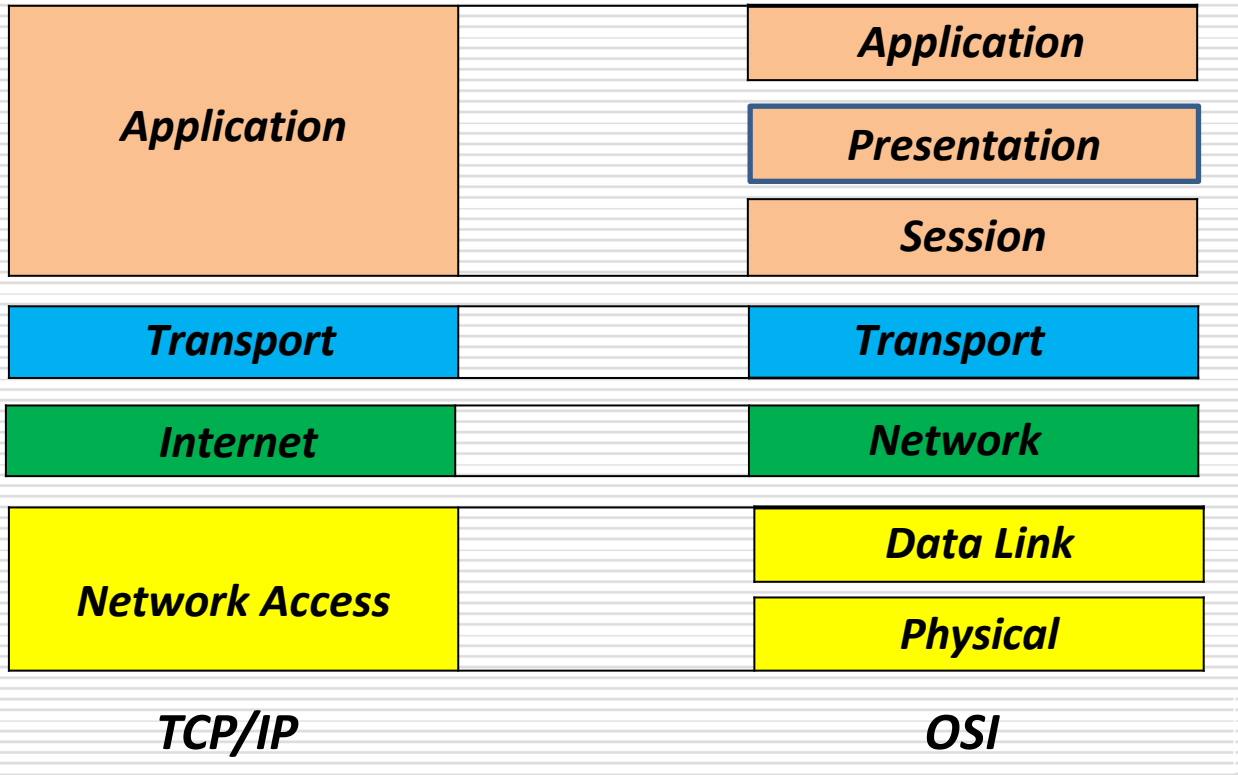
The practice begins!



General Overview of the TCP/IP Model

Application	***FTP, HTTP, SNMP TELNET, SMTP, DNS..***
Transport	***TCP UDP***
Internet	***IP, ARP, RARP, ICMP, IGMP***
Network Access	***FDDI, PPP, Ethernet, Token ring….***

TCP/IP VS OSI



Here, we are talking about protocols, not functionalities.

General Overview of the TCP/IP Model

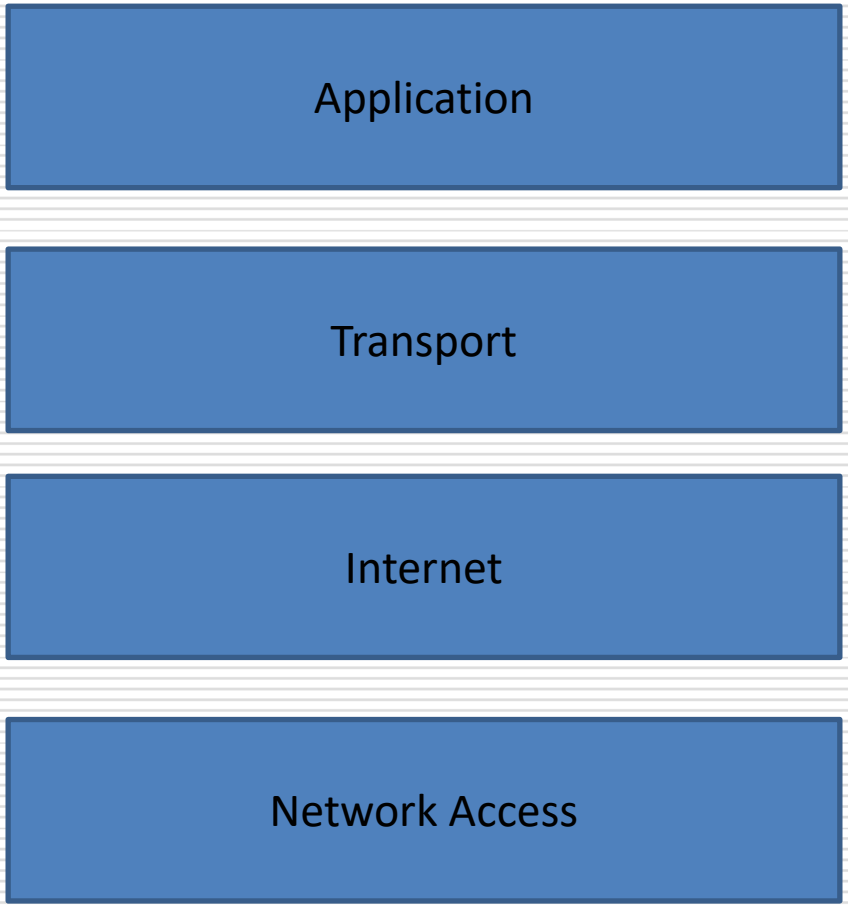
The model has the following characteristics:

- Ability to handle a high error rate.
- Low data overhead.
- Ability to easily extend into subnetworks.
- Independence from any specific vendor or type of network.

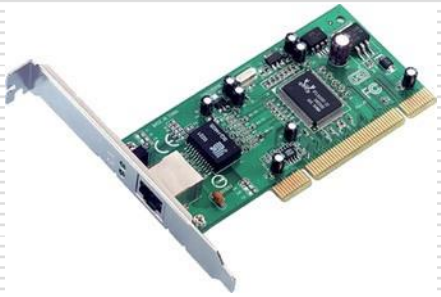
General Overview of the TCP/IP Model

- **Scalability**: Supports a large number of devices.
- **Interoperability**: Compatible with various systems.
- **Flexibility**: Works with different network types.
- **Robustness**: Handles errors and failures effectively.
- **Standardization**: Uses common protocols..

General Overview of the TCP/IP Model



TCP/IP Layers
Network Access layer



Application

Transport

Internet

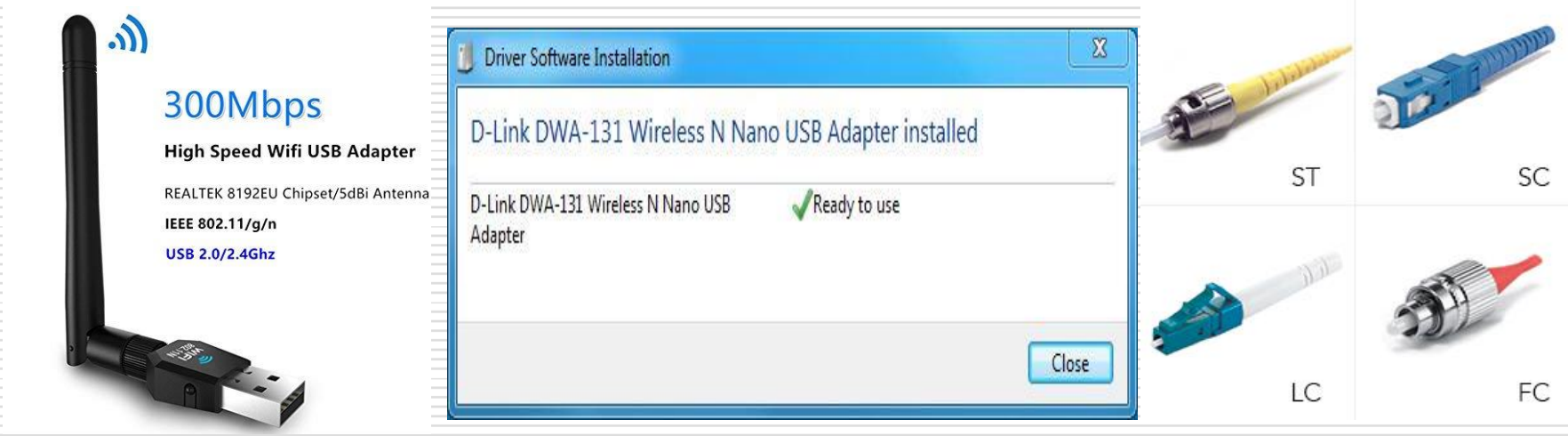
Network Access

Manages physical data transmission over the network medium

TCP/IP Layers

Network Access layer

It is the **interface** with the network, consisting of an **operating system driver** and a network interface card (NIC) in the computer..



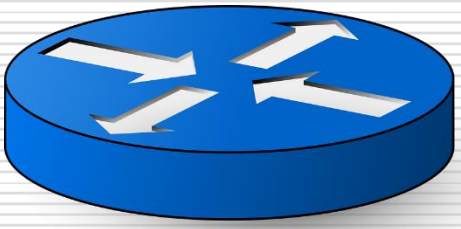
It corresponds to the data link layer and physical layer of the OSI model

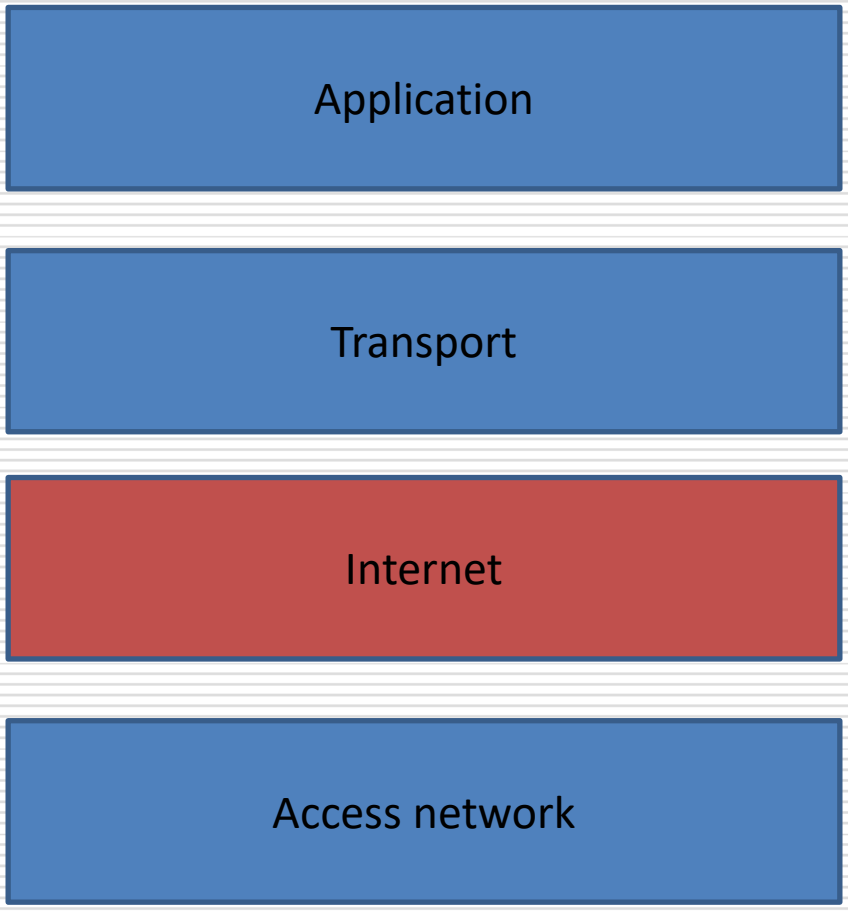
TCP/IP Layers
Network Access layer

The main function of network access layer is to transmit the information from one system to another that are connected in the same network Here, we use MAC addresses.

Technologies and Protocols: FDDI, Ethernet, Wi-Fi,Token Ring, …et

TCP/IP layers
Internet layer

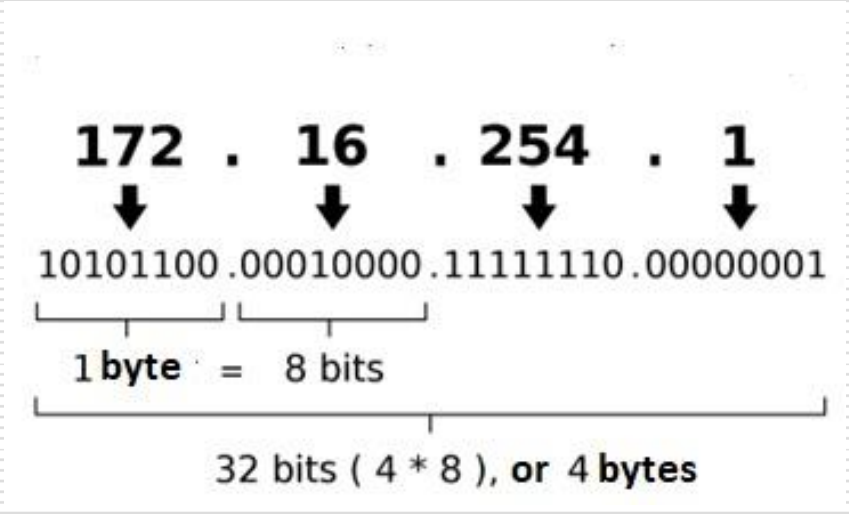




TCP/IP layers
Internet layer

Manages the flow of **packets** across the network by ensuring their **routing** and **addressing**. Some of its protocols include: **IP, ICMP, IGMP, ARP, RARP**…

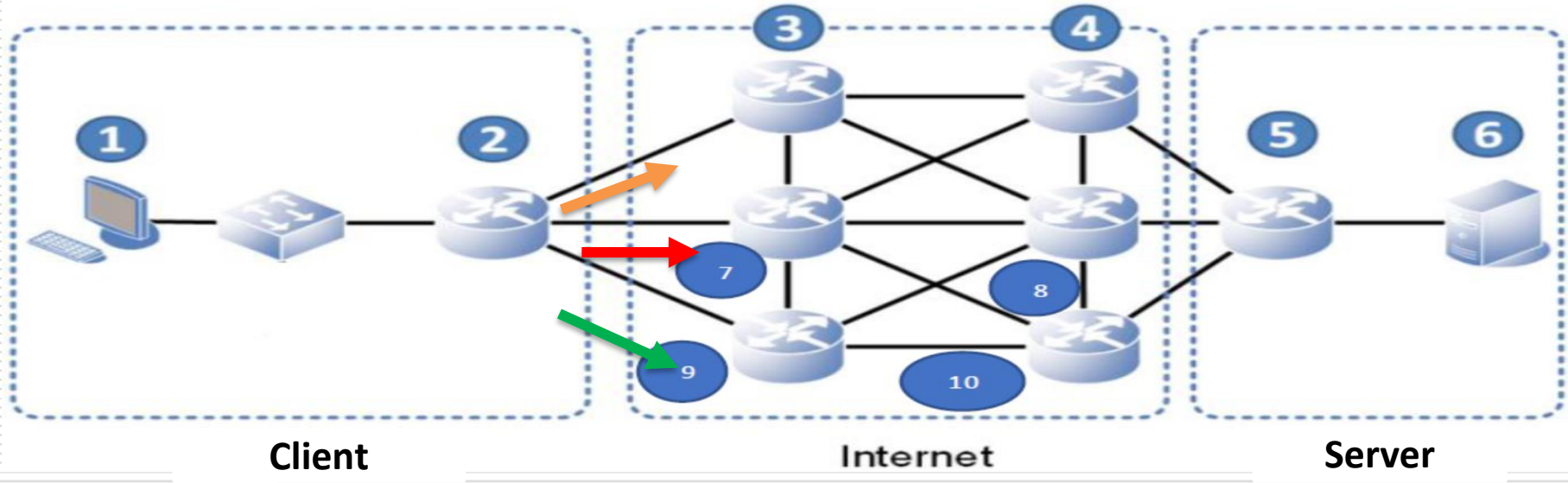
Routing



Logical addressing: IP

TCP/IP layers

Internet layer: Routing example

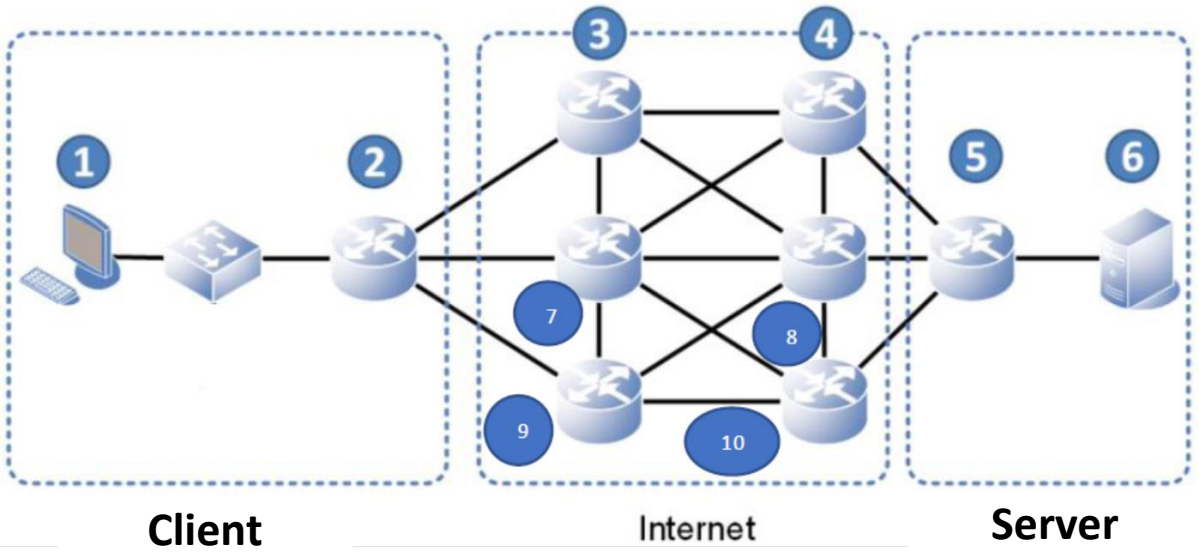


Router 2

Destination	Next hop	Number of hops
Server (LAN destination)	3	3
Server (LAN destination)	7	3
Server (LAN destination)	9	3

TCP/IP layers
Internet layer: routing example

Exercice : home work



Router 3

Destination	Next hop	Number of hops
Server LAN destination)	2	4
Server LAN destination)	7	3
Server LAN destination)	8	2
Server LAN destination)	4	2

TCP/IP layers
transport layer

Application

Transport

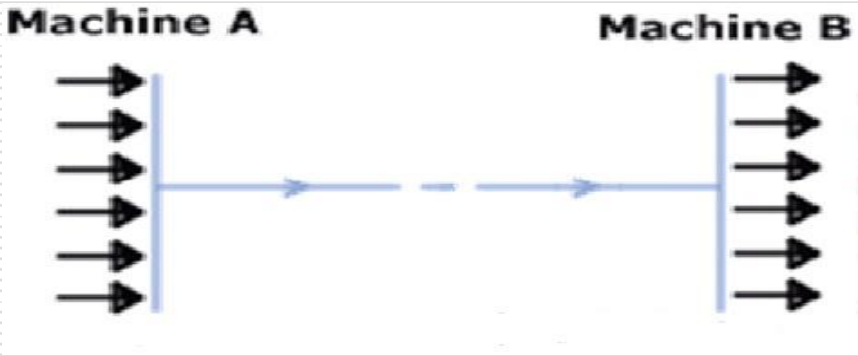
Internet

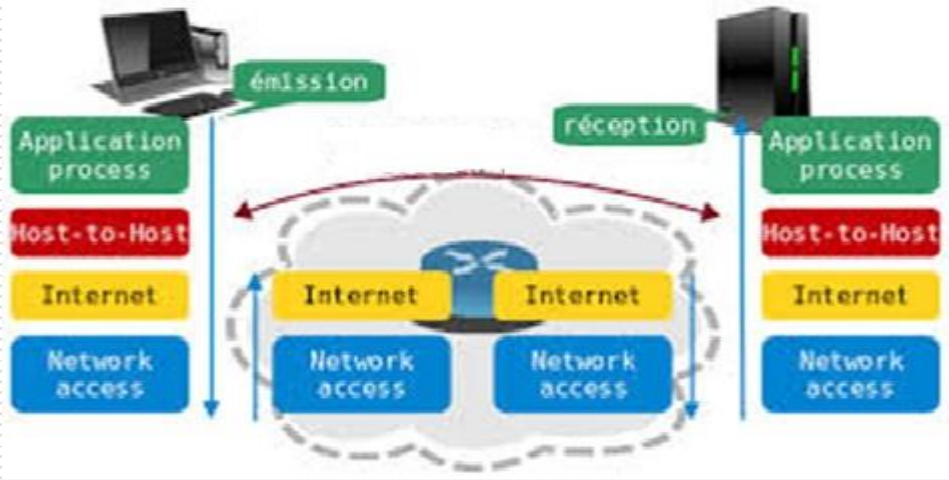
Network access

TCP/IP layers
Transport layer

Provides end-to-end communication, abstracting away intermediate machines.

- It manages data flow and ensures reliable transport in the case of **TCP**: connection-oriented mode.
- Unreliable and connectionless in the case of **UDP**.





TCP/IP layers
Application layer

Application

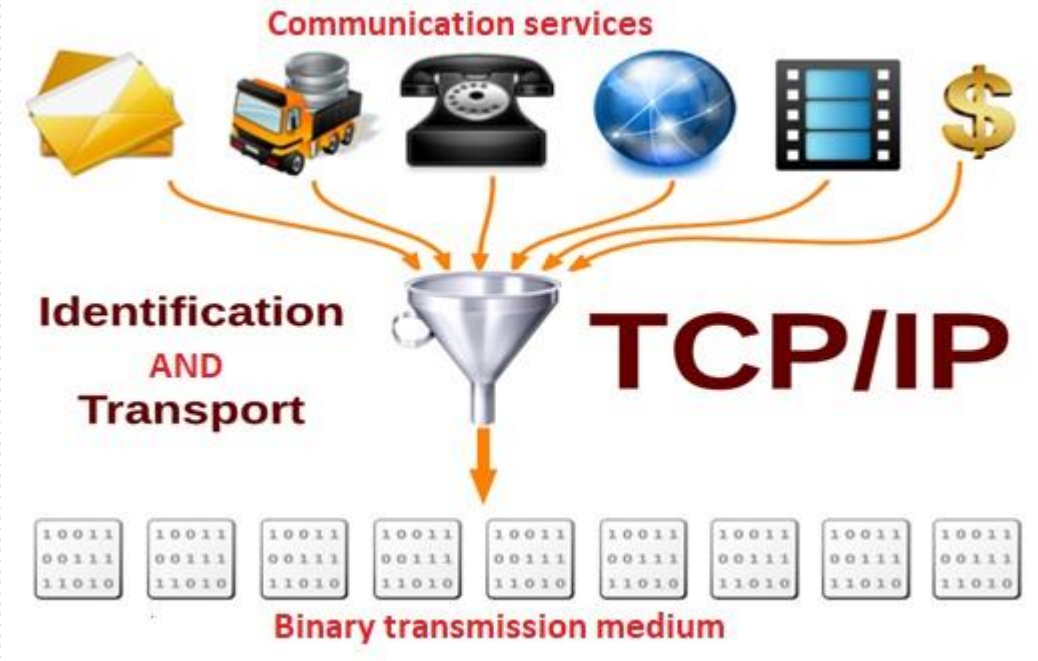
Transport

Internet

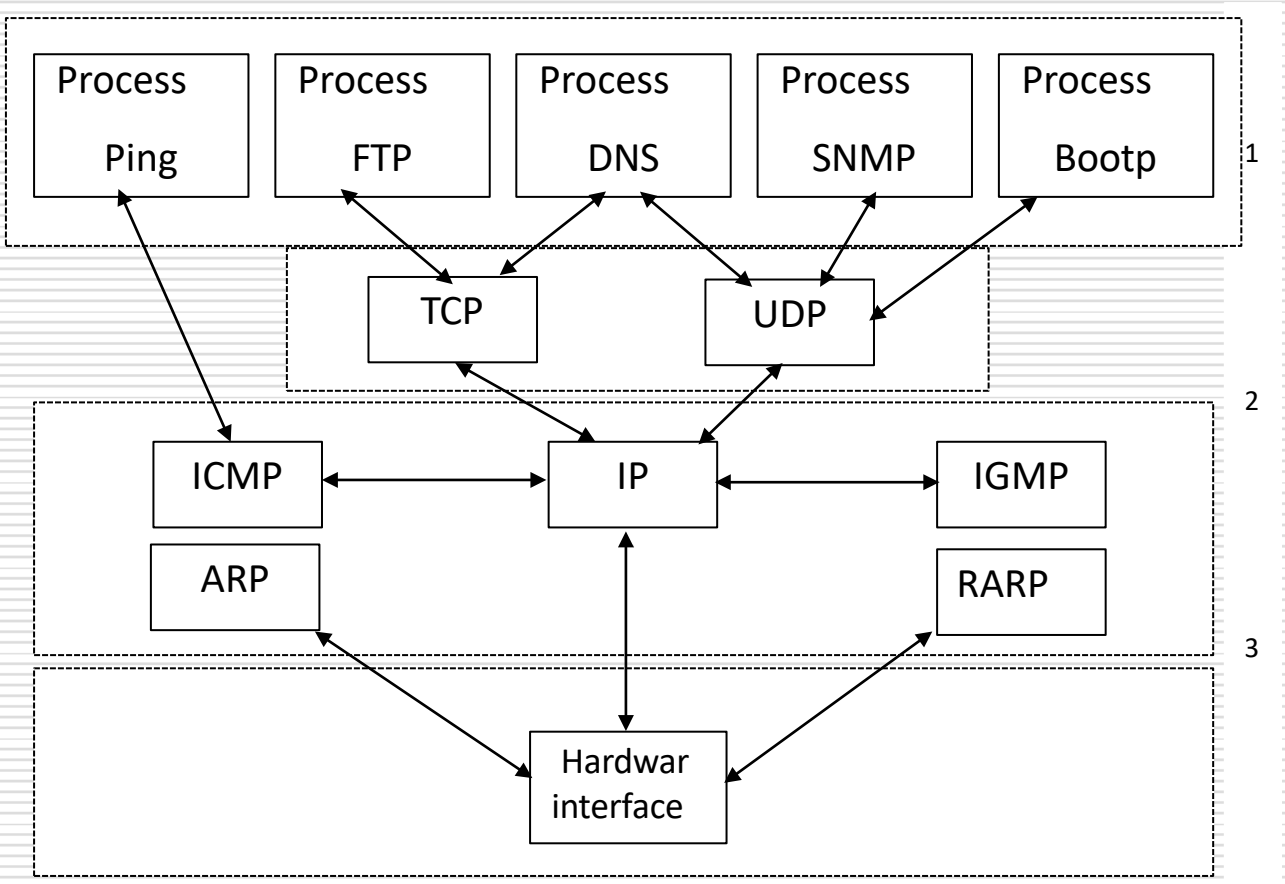
Network access

TCP/IP layers
Application layer

It includes user programs such as **Telnet** (connection to a remote computer), **FTP** (File Transfer Protocol), **SMTP** (Simple Mail Transfer Protocol), **HTTP** (Hypertext Transfer Protocol), and more.



General Overview of the TCP/IP Model



TCP/IP VS OSI

OSI			TCP/IP
7		application	Application **Network applications** (FTP, SMTP, DNS, Telnet ...)
6		Presentation	
5		Session	
4		Transport	Transport TCP **or** UDP
3		Network	Internet ICMP, ARP, RARP
2		**Data link**	**Network access** Ethernet, Token ring, FDDI ...
1		**Physical**	

TCP/IP VS OSI
The common points

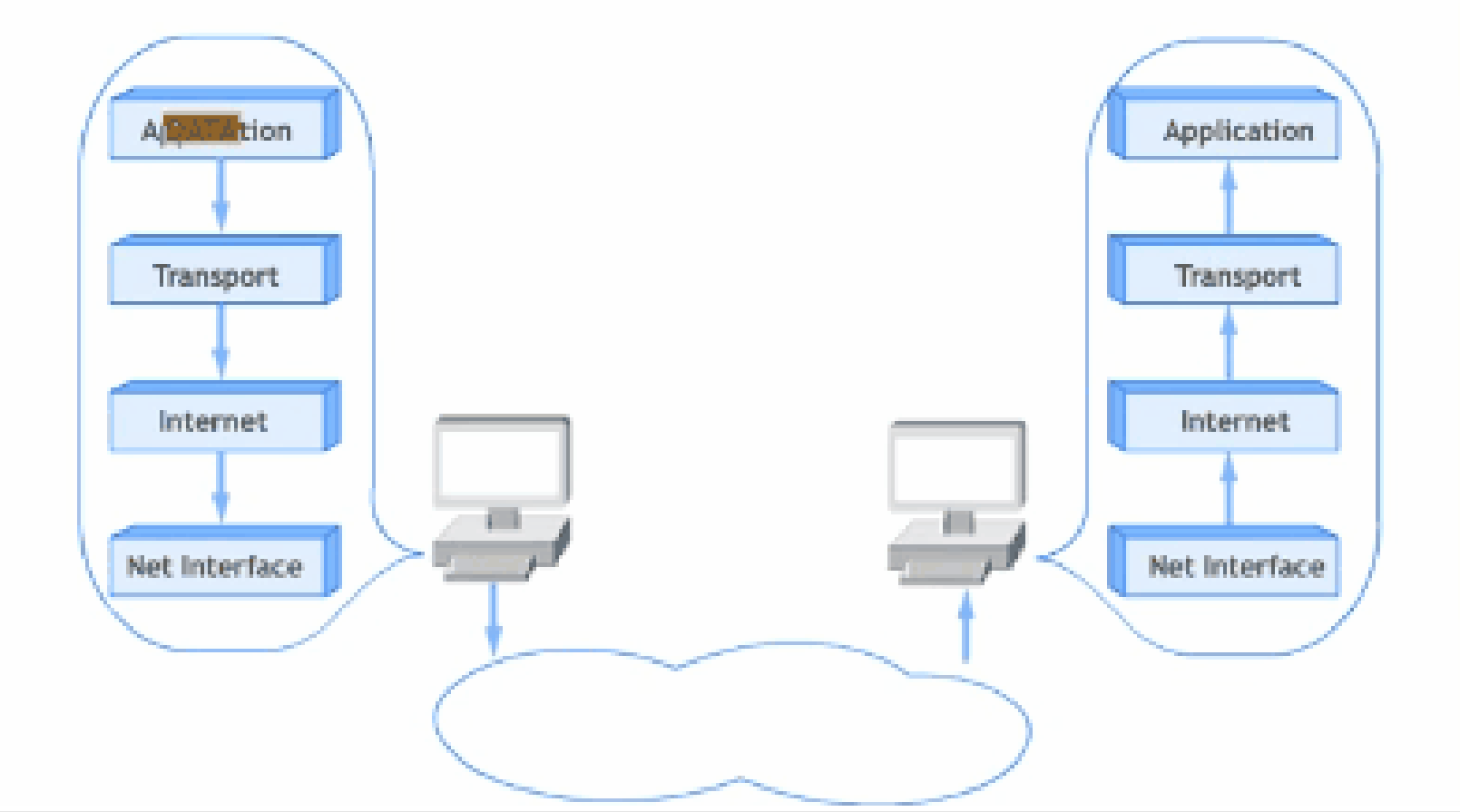
- Both are based on the concept of a **protocols stack**.
- The **functionalities** of the layers are generally the same.
- The layers up to the transport layer ensure **end-to-end communication.**
- The layers above the transport layer are **application-oriented layers.**

TCP/IP versus OSI
The differences

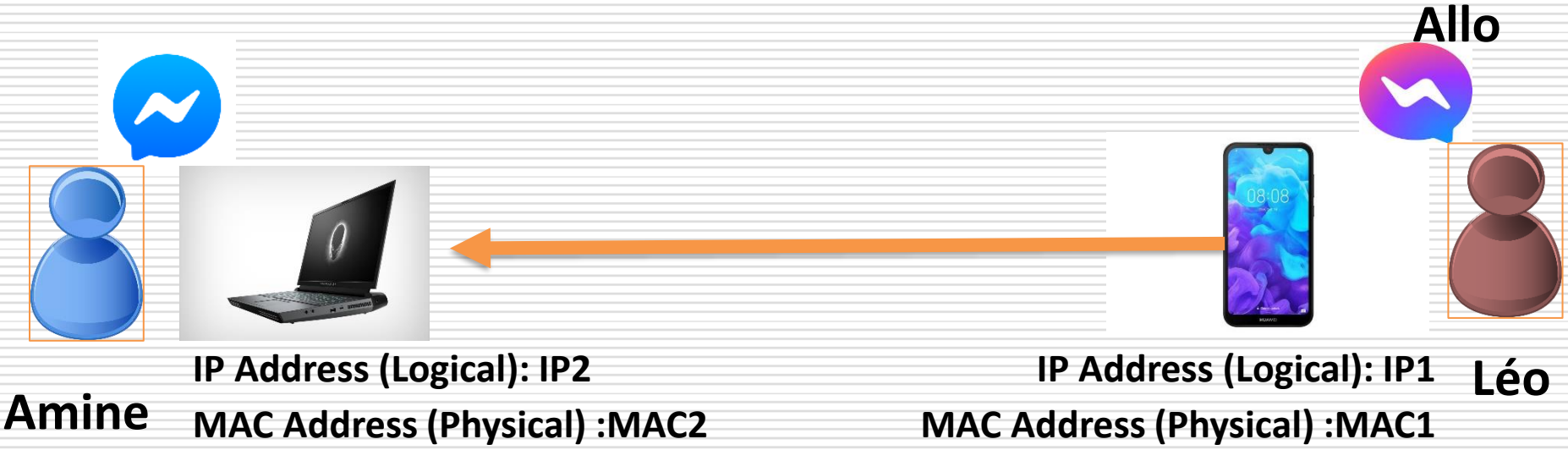
ISO	TCP/IP
OSI clearly distinguishes between: service, protocol, and interface.	Does not clearly distinguish between service, protocol, and interface.
OSI was designed before the protocols.	TCP/IP first defines the protocols.

Data encapsulation and data transmission.

Principle of data encapsulation.



Example of data encapsulation.



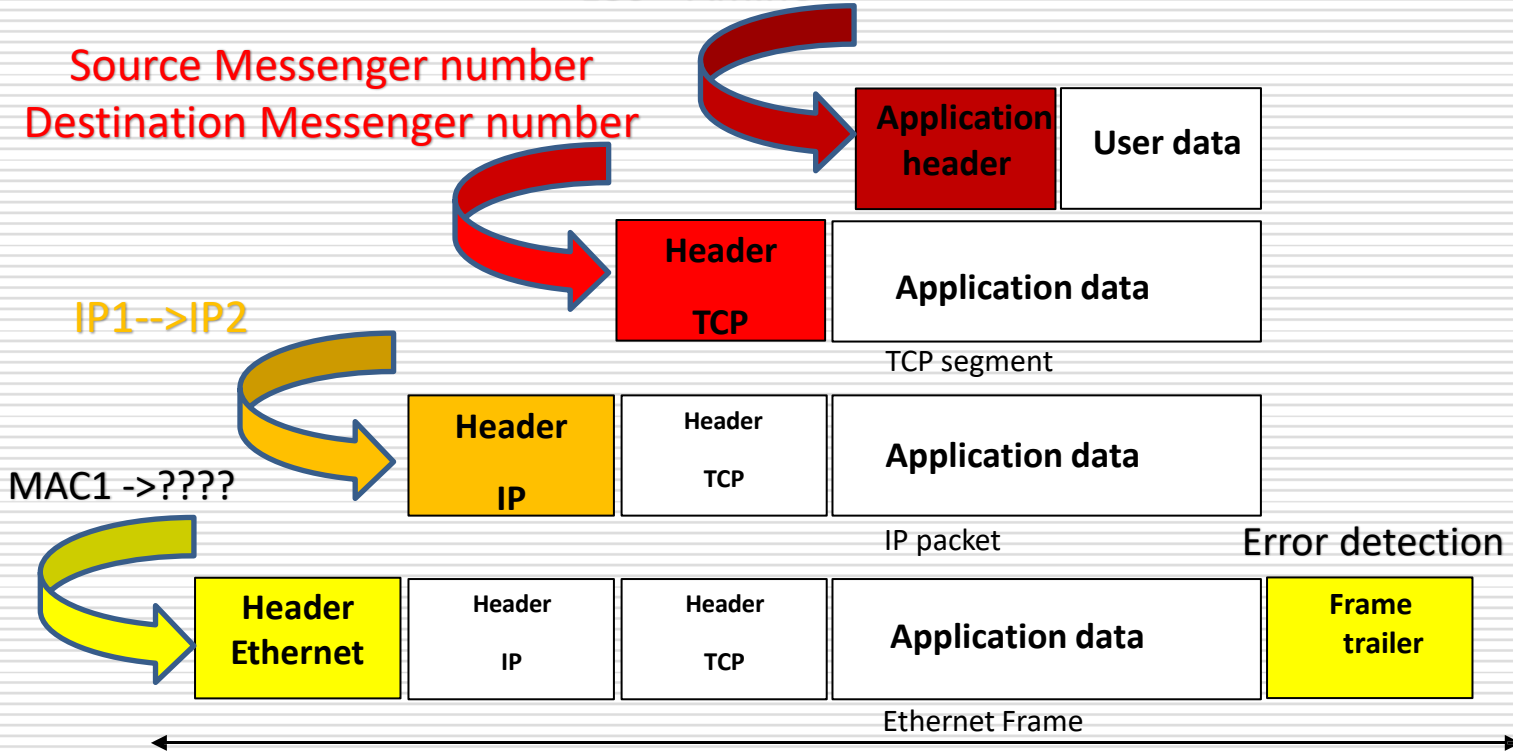
Example of data encapsulation.

Type of application: Messenger
Type of data: Voice
Léo->Amine

Source Messenger number
Destination Messenger number

IP1-->IP2

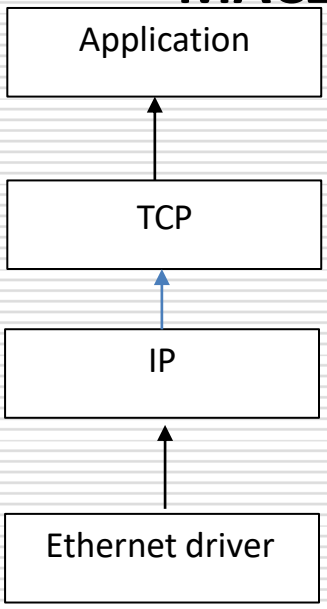
MAC1 ->????



Example of data encapsulation

Amine **IP2**

MAC2



Type of application: Messenger

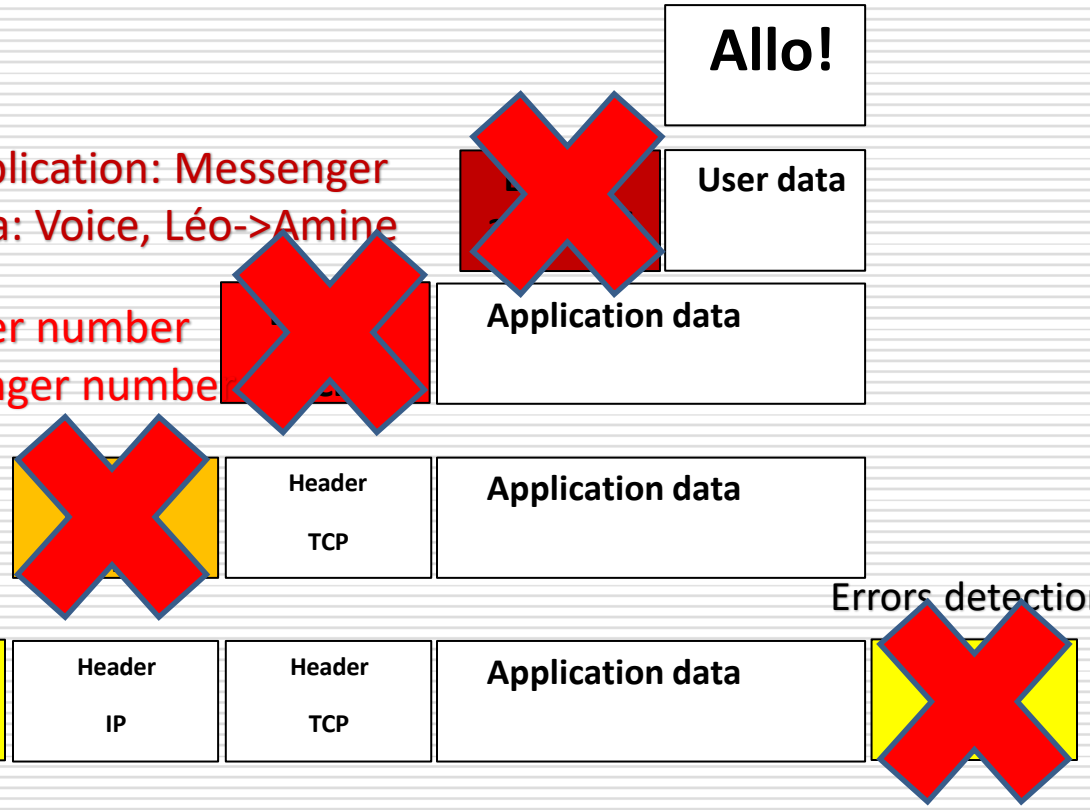
Type of data: Voice, Léo->Amine

Source Messenger number

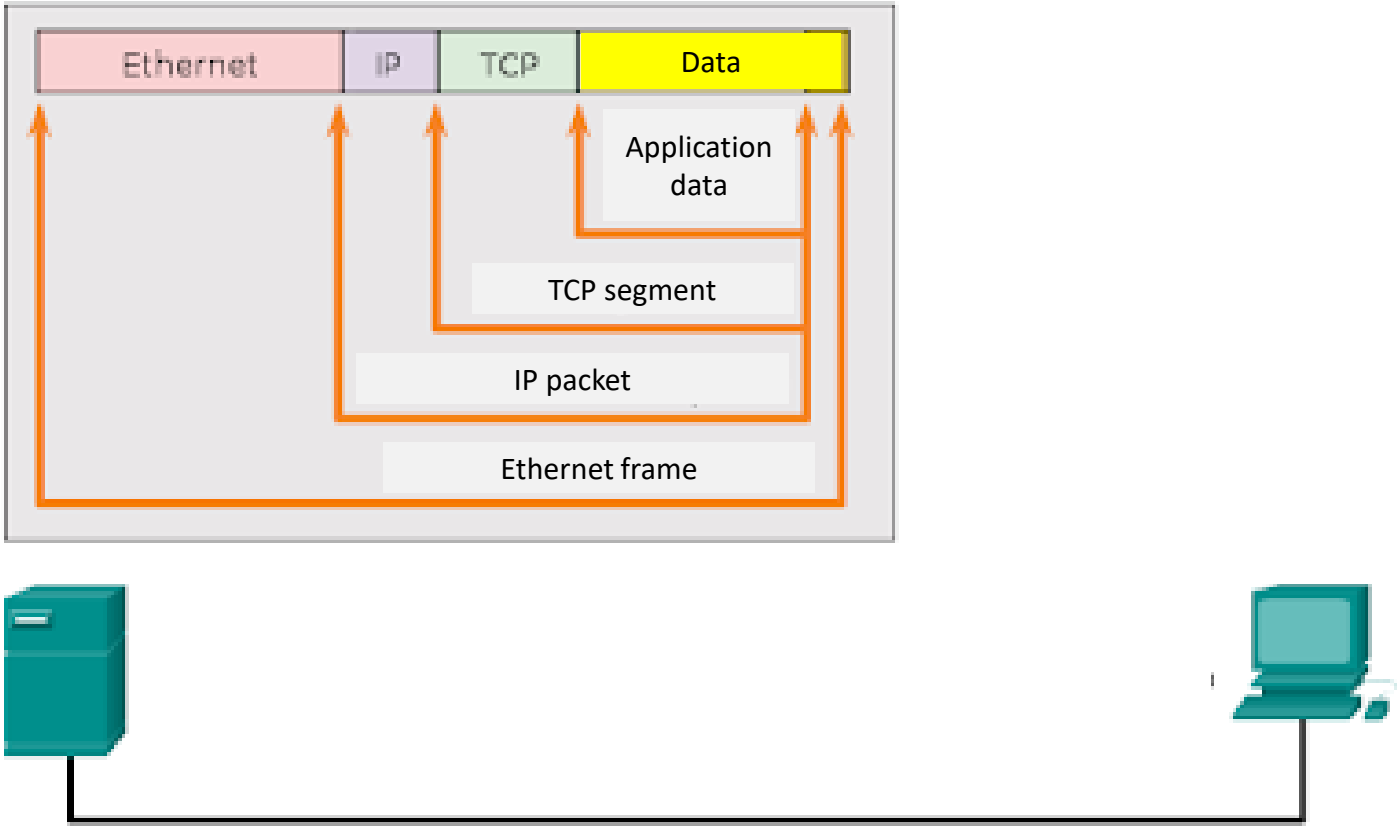
Destination Messenger numbe

IP1-->IP2

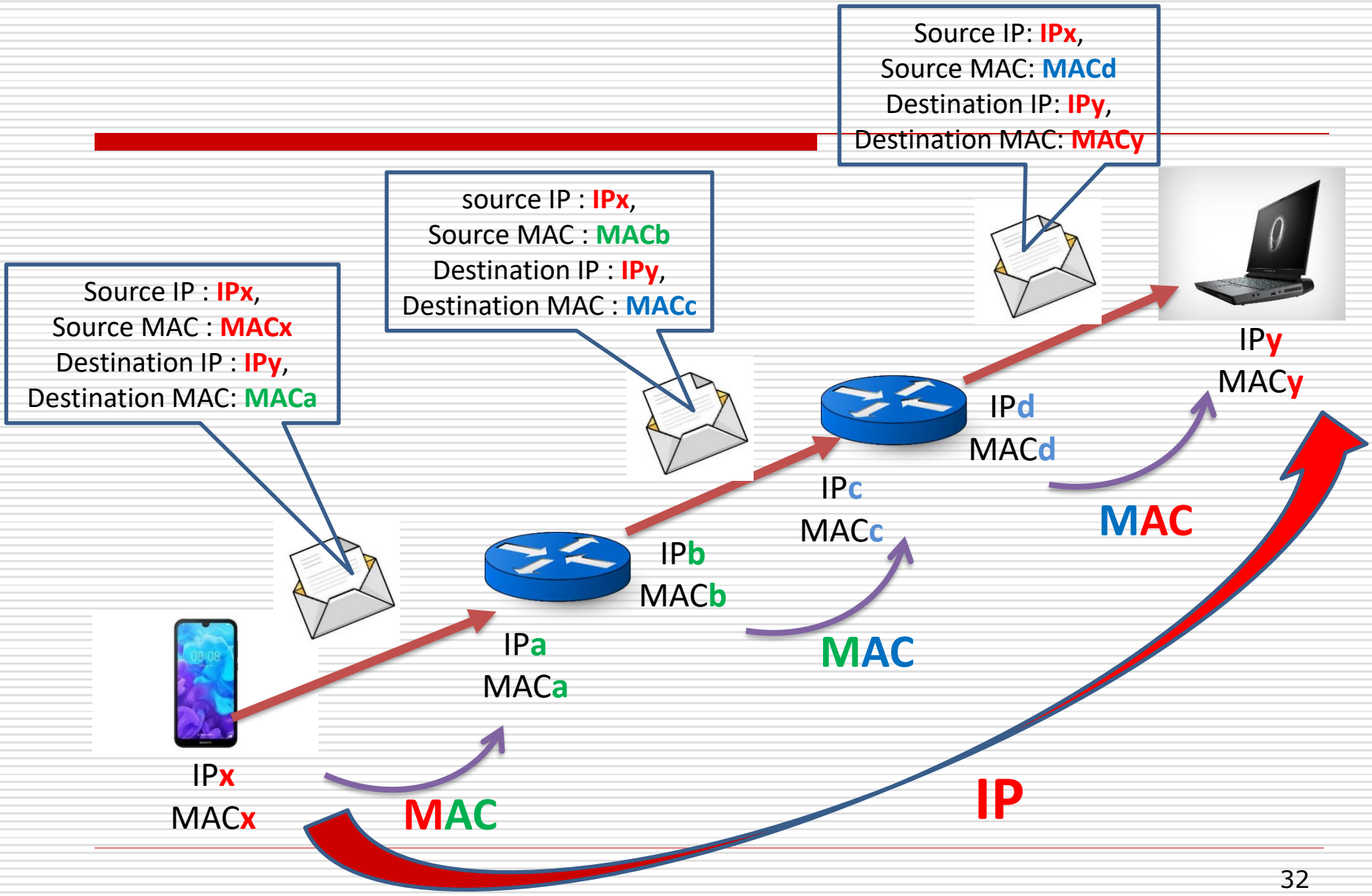
MAC2??



The traveling packet !



IP Adress **VS** MAC Adress



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